

Measurements of cosmic rays have been made by a variety of instruments—for example, cloud chambers, ionization chambers, special photographic emulsions, window geiger counters, and counter telescopes. Rockets have provided an important tool in observing cosmic rays up to altitudes of about a hundred miles. Earth satellites provide a unique tool for measuring the primary particles themselves at altitudes between 200 and 1,000 miles above the surface of the earth.

The magnetic field of the earth is the chief instrument for analyzing the energy of cosmic rays. Cosmic rays are bent in this field in such a way that low-energy rays cannot arrive at equatorial latitudes but tend to come in chiefly near the magnetic poles; high energy components arrive at all latitudes. To study the high-energy portion, observations are made near the Equator. To study the low-energy portion, observations must be made at high latitudes. Recent measurements of high-energy cosmic rays have caused physicists to reexamine their thinking about the location of the geomagnetic Equator and the distribution of magnetic fields about the earth.

The particles are related to solar phenomena and, in particular, to the large increase of radiations accompanying eruptions of gas on the solar disk. These coincide with disturbances in the ionosphere which may be so severe as to black out radio communications. Such violent solar flares are generally followed by magnetic storminess, which likewise is known to cause violent changes in the earth's magnetic field and which can adversely affect radio communication circuits. Detailed knowledge of cosmic rays requires simultaneous investigations of solar flares, sunspots, and chromospheric eruptions.

During the IGY scientists expect to gain knowledge of the reasons for the large decreases of cosmic-ray intensity during some magnetic storms, fluctuations in cosmic-ray intensity near sunspot maximum, the worldwide variation of cosmic-ray intensity with the sunspot cycle, and sudden large increases of cosmic-ray intensity within an hour or less after the beginning of solar flares or chromospheric eruptions. Observers working at a network of stations will utilize simultaneous balloon and rocket flights in different latitudes and longitudes during periods of increased solar activity.

The series of simultaneous flights of balloons and rockets will yield data on primary cosmic radiation in the different latitudes of the earth and will help to answer the question of whether cosmic radiation is symmetrical in both hemispheres. The primary rays themselves will be studied through appropriate instrumentation on satellites which reach beyond the earth's masking atmosphere. As in meteorology, there already exists a network of cosmic-ray stations. During the IGY, additional stations will be established, with emphasis on stations spread latitudinally between the poles.

EARTH'S CRUST AND CORE

Storms at sea and in the atmosphere are familiar enough. The earth itself appears solid and stable, but this is far from true. The earth is subject to continual stresses and strains, related in large measure to its varying composition. Violent earthquakes reveal dramatically from time to time the existence of these stresses and strains, but the large number of earthquakes noted by instruments provides